IGS Component Reports 2009

Component Name :

Infrastructure Committee

Date of establishment: **2009**

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Charter last updated? **2009**

Activities in 2009

The IC is an advisory body of the IGS GB and works closely with the IGS CB and NC to address short and long term station related issues. During the first year of operation we have undertaken major discussions and investigations following the charter. The details of the accomplishments this year are as follows:

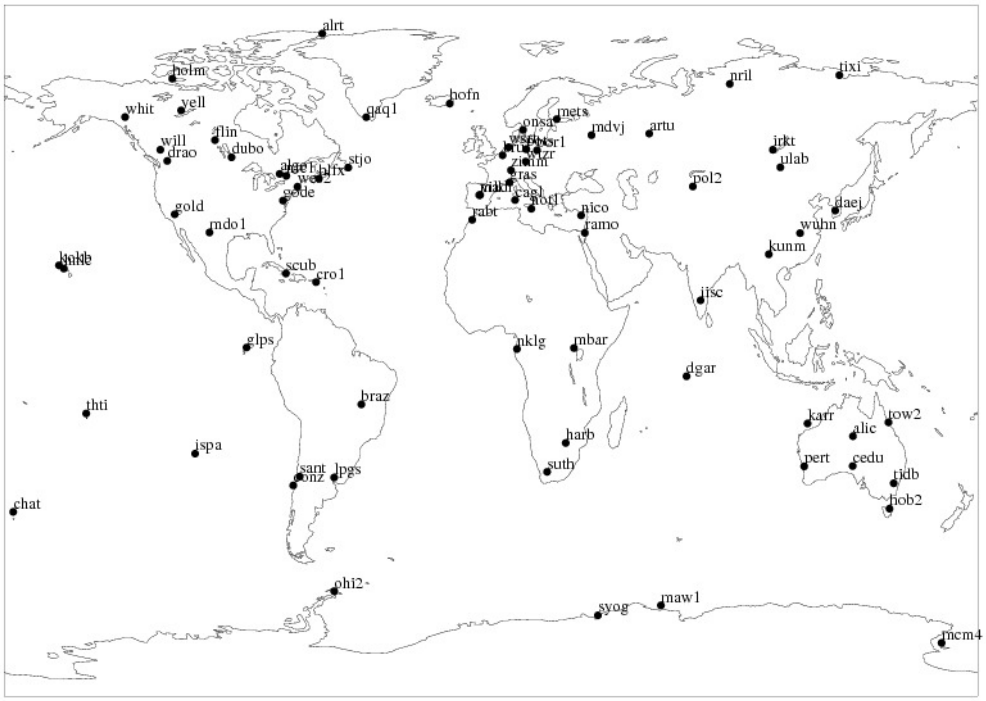
+ ***Network Coordination***: The IC has insisted in the importance of **maintaining fluid and open communication with the Station's** "owner agencies" and operators. Following an IC recommendation the NC has established a new communication method to reach the stations better. It is hoped that stations will react positively to reminders of the new antenna requirements (as drafted by the AWG in the 2008 recommendations), requests to current Reference Frame stations not to touch the stations, etc. We need more collaboration from agencies with stations so as to bring the stations closer into the IGS family.

+ ***Network Monitoring***:
As precursors of possible monitoring ideas for future IGS CB enhancements the following has been done:

1) The IC have started to **monitor the actual flow of stations data files** into 3 of the 4 IGS Data Centers (assuming KASI is a CDDIS mirror), this can be found updated every few hours, automatically in IC web pages:

- station header/log inconsistencies are tracked,
- stations missing (not yet delivered) are reported during the day
- stations RINEX file versions are summarized,
- station numbers available per DC are reported,
- a map of the stations not yet delivered for the previous day is dynamically generated,
- a plot of the numbers and percentage of IGS stations missing each day over the last 50 days (stable at 17% of missing IGS stations each day)

2) The IC have started to **monitor, document and track the Reference Frame Stations** online week to week following the RFWG weekly combinations. The attrition rate of RF stations is of great concern as to keep IGS products aligned to the ITRF the stations need to continue to be part of our ITRF realization (from IGS05). The IC and the RFWG have now documented all major RF station exclusions (55 stations have been dropped from the IGS RF realization since Nov 2006). The IC monitoring shows each week that the current RF station numbers remain stable (70-75 stations per week), and that their distribution remains acceptable:



Reference Frame stations for the week of Nov 15, 2009

3) The IC has **run a series of "Station Height Tests"** using 300+ stations over 5 days in 2009 and posted the results online to better understand the possible dependence between elevation angle and height estimation at each site. A strong correlation of these two parameters would indicate a bad antenna, a bad local multipath environment, or a poor antenna mount. This test is not conclusive but hopefully goes some way to help in the development of better Reference Frame Station guidelines to be able to continue to support the earth sciences with increasing precision.

+ ***Network Improvements***:
1) The IC has recommended to the DCWG the creation at each DC **an independent broadcast navigation files**. Independent broadcast navigation files exist at CDDIS ("brdc"), SIO ("auto"), BKG has recently implemented it, and IGN will do it soon.

2) The IC has also recommended to the DCWG that **each DC has a summary file of each day's data holdings** (at CDDIS it is called the .status file). Having summaries of each DC's data holdings would be important to quickly automate data arrival, completeness, header accuracy, etc. CDDIS will make their "summarizing" software to the other DCs to standardize the format and the information contained therein.

3) The IC, with the invaluable help of the AWG Chair and others, have recommended the **updating of the Site guidelines** to reflect the IGS WS 2008 recommendations. The IGS CB proceed with the guideline updates as directed.

+ ***Data Exchange Formats***:
After much debate and some confusion the IC is on the way of **establishing a "vendor contact group"** involving Steve F./Lou E. & Chuck M./Mike S. and Georg W. as best suited within the IC to promote the new RINEX versions directly with the manufacturers. These new versions require the manufacturers be involved so that they may write the formats directly on their receivers, or provide a common binary output as they know what they are doing with the phase offsets, demodulations, etc. This ties directly with the new RTCM message definitions for streamed data which is an on-going development, and which is geared to fully comply with RINEX3.01 , and where IGS RTPP are playing a very constructive role.

+ ***Real-Time activities***:
Through Georg W. and Mark C. we have been informed of the **real-time capabilities and issues from the RTPP**. The IC has learned how certain 1Hz 15minute station files are coming directly from the accumulated streams and how helpful that can be. The IC has also been informed of the proposal for the RTCM messages, etc. From the IC point of view the RTPP has the Real-Time issues under control and the IC should continue to be informed through Georg W. & Mark C. and to ask questions if needed. The IC has raised some flags to the RTPP in terms of repeated 4 character acronyms for RTPP stations, the correct maintenance of RTPP station configuration, etc, all of which have been taken very well by the RTPP, as expected.

What is plan for continued activities? Please detail main work plan for 2010 -2011.

+ **Priorities for 2010-2011**:
The IC recognizes the following issues as priorities for the upcoming years. These are issues that need our attention continuously so as to continue progress.

1) To **reduce the attrition rate of the current IGS Reference Frame stations** to a minimum. This is done by communicating with the remaining RF stations, explaining the important role their station is playing in the IGS and encouraging all RF station owners/operators to leave their stations configuration untouched (no unnecessary upgrades).

2) To continue to work **to develop the recommendations for the future RF stations (RF2.0)** so that the IGS can continue to support the earth sciences with increasing precision. It is clear that while many IGS stations perform adequately some problems remain in the network (as the Station Height Tests shows above, etc). These effects will prevent the network from providing the needed accuracy for the future, especially in terms of the RF stability and accuracy. Therefore the IC will continue to document the current issues and develop standards that new RF stations must satisfy. Areas of concern that will be addressed are:

- Strict equipment change adherence to the guidelines (parallel operations, etc)
- Improved monumentation for the antennas, (less pillars and more drill braced?)
- Improved monumentation description for thermal/multipath characterization: include monument size above/below ground, height of antenna over closest reflecting surface, etc
- Reduction of near-field multipath: microwave absorbing materials?

The information guiding these improved recommendations will come from the accumulated experience at the IC, the upcoming ITRF08/IGS08 RF station selection process, continued experiments like the "Station height test", etc.

The recommendations will create the basis for the "RF2.0" in which the IGS network needs to set ambitious goals in terms of RF stability for the next decade and beyond. With the full expectation that many current installations will have to be improved or new ones installed of much higher quality.

3) **Support the adoption of the new RINEX formats (2.12/3.01)** via the IC "vendors contact group", the RINEX management group at AIUB, the RTCM participation of the RTPP, etc. The IC will promote the adoption of a binary output format (RTCM?/BINEX?) that will fully support the translation of the receiver observations into RINEX, or encourage vendors to write RINEX directly onboard to avoid confusion. The IC will also support the evolution of ***teqc*** in this direction, to continue to provide as a minimum the same quality checking functions we now

enjoy for versions 2.12./3.01, and if the vendors agree on a binary format then translation to RINEX as well.

How does the activity support the IGS strategic plan and implementation plan?

To maintain the highest quality data provision at the IGS.
To advise on station installation, monitoring and data quality issues.

Nacho Romero
Dec, 2009